Appendix E

Estimated Intake of Vitamin D by Consumers

Proposed Vitamin D Fortification of Fruit Juices and Juice Drinks: Estimated Intake of Vitamin D by Consumers

Prepared for
The Minute Maid Company
Houston, Texas

Prepared by
ENVIRON International Corporation
Arlington, Virginia

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TABLE OF CONTENTS

TABLES

APPENDIX

Proposed Vitamin D Fortification of Fruit Juices and Juice Drinks: Estimated Intake of Vitamin D by Consumers

I. Introduction

ENVIRON International Corporation (ENVIRON) is pleased to provide The Minute Maid Company (Minute Maid) with estimates of the intake of vitamin D by consumers of fruit juices and/or juice drinks. The intake estimates presented in this report are based upon proposed vitamin D fortification of calcium fortified fruit juices and juice drinks. Naturally occurring vitamin D and fortification of products are also reflected in the estimates.

The estimates presented in this report are a modification of estimates originally presented in "Proposed Vitamin D Fortification of Fruit Juices and Fruit Juices and Juice Drinks: Estimated Intake of Vitamin D by Consumers, Revised with Addendum July 2000" completed by ENVIRON. No changes were made to the vitamin D database developed in 2000 and used in the original report provided to Minute Maid, nor were data from more recent national food consumption surveys (Supplemental Children's Survey (CSFII 1998)) used to complete the estimates.

This report will be submitted to the U.S. Food and Drug Administration by Minute Maid as part of a Food Additive Petition to allow vitamin D fortification of fruit juices and juice drinks. The results of this analysis will be used to determine the impact of the proposed fruit juice and juice drink fortification on the health and safety of Americans.

II. Methods

A. Data sources

1. Food consumption data

The food consumption data used in this analysis were results of the 1994-96 USDA Continuing Survey of Food Intakes by Individuals (CSFII), as provided on CD-ROM by the National Technical Information Service (USDA, 1998).

The 1994-96 results include two full days of intake data for over 15,000 individuals residing in the United States. In the 1994-96 CSFII, respondents provided recall data on each of two days, approximately one week apart. The survey sample was designed and recruited using multi-stage area probability sampling procedures.

2. Vitamin D concentrations in foods

The CSFII does not include nutrient data for vitamin D. Consequently, it was necessary for ENVIRON to construct a database quantifying the vitamin D content of each food reported in the CSFII prior to estimating intakes.

Naturally occurring vitamin D is found in some foods, but most food-based vitamin D results from fortification. Using data on the concentrations of naturally occurring and fortification-based vitamin D in foods, ENVIRON calculated the concentrations of vitamin D in each of the CSFII food codes. The calculations were completed using both USDA recipes and the ENVIRON proprietary commodity level recipes. The USDA recipes are based on the Primary Data Set (PDS) ingredients, and the ENVIRON proprietary commodity level recipes are based on Raw Agricultural Commodities (RACs) (USDA, 1998; Peterson and Fleming, 1990).

Not all foods that are allowed to be vitamin D fortified in accordance with federal regulations currently are fortified, and foods that are fortified do not necessarily contain the maximum vitamin D level allowed. The vitamin D database was built to reflect naturally occurring levels of vitamin D in foods and current fortification practices in the United States.

In the database, ENVIRON quantified the amount of vitamin D in International Units (IU) per 100 grams food code. When necessary, data were converted to IU using the following conversions: 0.025 micrograms vitamin D = 1 IU vitamin D; and 1 United States Pharmacopeia (USP) vitamin D = 1 IU vitamin D.

a) Naturally occurring levels of vitamin D

A relatively small number of food categories consumed by Americans contain naturally occurring vitamin D, and with the exception of fish, naturally occurring levels in most foods tend to be low. Foods with quantified levels of naturally occurring vitamin D were identified from vitamin D data compiled by the USDA and reviews of the published literature. The foods with naturally occurring vitamin D that were included in the database are:

- Butter
- Buttermilk
- Cheese
- Cream
- Eggs
- Fish
- Goatmilk
- Meat fats and organ meats
- Mushrooms
- Sour cream

b) Fortification levels of vitamin D in foods

Vitamin D fortification is permitted under several federal regulations. The primary regulations governing vitamin D fortification are 21 CFR § 184.1950 and § 184.1(b)(2). These regulations state that vitamin D may be added to a limited number of foods for the functional use of nutrient supplementation. The food categories included on the approved list include breakfast cereals, milk, milk products, grain products and pastas, infant formula, and margarine. The vitamin D fortification regulations as well as descriptions of the applicable food categories are detailed in Table 1.

Standards of Identity (SOI) exist for several of the dairy products and grain products that are identified under 21 CFR § 184.1950. Many of these SOIs also permit vitamin D fortification; the SOIs are summarized in Table 2. The levels of fortification permitted under 21 CFR § 184.1950

and the SOIs for these dairy products and enriched grain products allow for similar though not necessarily identical concentrations of vitamin D in these food items.

The data in the database that represent the current vitamin D fortification levels were developed from information collected from manufacturers, associations representing food industries, product labels, and the USDA and Nutrition Data System for Research (NDS-R) databases. The foods in the U.S. that were found to be currently fortified include many brands of ready-to-eat breakfast cereals, infant formulas, select infant cereals and toddler foods, select brands of margarines, fluid milk, dried milks and many dairy based beverages/beverage mixes.

Ready-to-eat breakfast cereals and infant formulas are identified by brand name in the CSFII survey. The vitamin D content per serving of these foods was identified primarily from manufacturer and product label information. When information could not be found for discontinued products, vitamin D values were imputed based upon specific brand name, manufacturer, and type of cereal.

During the development of the fortification database, ENVIRON discovered the existence of infant cereals "made with the ingredients of formula," including vitamin D. These products appeared to be relatively new on the market. Although the extent to which infants in the U.S. currently use these fortified cereal products is unknown, all infant cereals were assumed to be fortified at the levels found in these products.

Fortification of margarines was found to be brand-specific. Given that the USDA recipes do not identify margarines by brand name, the vitamin D content of all margarines was set at 440 IU per 100g based upon data from NDS-R and product labels.

All fluid milk (regular, flavored, and cultured) was assumed to contain 400 IU vitamin D per quart, which is consistent with the SOI for fortified milk. The dairy industry estimates that approximately 98% of all fluid milk sold at the retail level currently is fortified with vitamin D at levels specified by the SOI (400 IU per quart). Research published in the past decade suggested that the majority of fortified milks contained levels of vitamin D below 320 IU per quart (IOM 1997). ENVIRON was unable to locate current published data to determine if the problems of misfortification (primarily under fortification, though over fortification has also been reported) continue to exist. ENVIRON contacted the International Dairy Foods Association for information, and was informed that the industry believes that fewer problems of misfortification currently exist due to the introduction of better vitamin testing procedures within the last decade.

Evaporated and dried milks were assigned fortification levels established by the SOIs for vitamin D fortified milks (400 IU per quart as prepared). Fluid and dried milk used by manufacturers in the production of foods such as ready-to-eat puddings and milk chocolates are typically not vitamin D fortified according to information from the dairy industry and product labels. The vitamin D content of these products was assumed to be zero in the database.

Several dairy-based beverages and dairy-based beverage mixes (e.g., ready-to-drink and powdered meal replacements/supplements, fortified malted milk mix, and shake mix) were found to be vitamin D fortified; these products were included in the current fortification database at their present levels of fortification. A range of vitamin D concentrations often was found within

Population Groups
0 through 6 months (non-breastfeeding)
0 through 6 months (breastfeeding)
7 through 12 months (non-breastfeeding)
7 through 12 months (breastfeeding)
1 through 3 years (non-breastfeeding)
1 through 3 years (breastfeeding)
4 through 8 years
9 through 13 years
14 through 18 years
19 through 30 years
31 through 50 years
51 through 70 years
71 through 90 years
Pregnancy/Lactation ≤ 18 years
Pregnancy/Lactation 19 through 50 years
Total population: 2 years and older
Pregnant and/or lactating females are included only in the Pregnancy/Lactation and Total population: 2 years and older population groups.

C. Analysis

ENVIRON identified the population of fruit juice and juice drink users in the survey. Using the vitamin D database, ENVIRON then estimated 2-day average mean and 90th percentile intakes of vitamin D based on current sources of dietary vitamin D (naturally occurring and from currently fortified foods). ENVIRON also estimated vitamin D intake from the proposed fortification of fruit juices and juice drinks combined with all current vitamin D sources. These estimates were referred to as "prior to" and "following" the proposed fortification, respectively.

Additionally, ENVIRON estimated 2-day average mean and 90th percentile intakes of vitamin D from selected food sources and all dietary sources of vitamin D combined. The selected sources include dairy products (fortified milk and milk products as well as naturally occurring vitamin D in other dairy products), and the proposed fortification of fruit juices and juice drinks.

All 2-day average mean and 90th percentile intake estimates were calculated using the USDA weighting factors generated to adjust for differences in representation of subpopulations. The WesVar Complex Samples Version 3.0 software was used to estimate means and the 90th percentile intakes.

Using supplement data recorded in NHANES III, ENVIRON also estimated typical intake of vitamin D-containing supplements by population group. In this analysis, both breastfeeding and non-breastfeeding infants were included in the infant populations as it was not possible to distinguish the feeding practices of all infants in the survey.

III. Results and discussion

A. Intake of vitamin D from dietary sources – prior to and following proposed vitamin D fortification

Table 3 presents estimates of vitamin D intake by users of fruit juices and/or juice drinks. The results include estimates of 2-day average mean and 90th percentile of vitamin D intake from all current sources of vitamin D (naturally occurring vitamin D and current product fortification of vitamin D). Estimates of mean and 90th percentile of vitamin D intake from all current sources of vitamin D combined with the proposed Minute Maid fortification of fruit juices and juice drinks are also provided in Table 3.

Results of the analysis indicate that approximately 49 percent of the population ages 2 years and older consumes fruit juices or juice drinks at least once during a 2-day period. Approximately 81 percent of non-breastfeeding infants and toddlers 1 to 3 years of age consume the products, while consumption was reported for 33 percent of non-breastfeeding infants 0 through 6 months, and 67 percent of non-breastfeeding infants 7 through 12 months.

Assuming current fortification practices of vitamin D, the population of fruit juice and juice drink users ages 2 years and older is estimated to consume an average of 197 IU vitamin D per day; the 90th percentile of intake for this population is 368 IU per day. Mean vitamin D intake by non-breastfeeding infants under one year of age who consume fruit juices or juice drinks is 386 IU per day for infants 0 through 6 months of age, and 373 IU per day for infants 7 through 12 months of age; 90th percentile intakes by these populations are 583 and 516 IU per day, respectively Infant formula is fortified with vitamin D and is the primary contributor to the total dietary vitamin D intake of these infant populations. Pregnant and/or lactating females ages 19 and older reported a mean vitamin D intake of 247 IU per day and a 90th percentile intake of 395 IU per day.

Estimates of vitamin D intake by breastfeeding infants are presented, though it is important to note that the estimated vitamin D intakes by these individuals do not include the vitamin D provided by breast milk. As previously indicated, the amount of human milk consumed by each infant is not quantified in the CSFII diet recalls, so it is not possible to calculate total vitamin D intakes for the breastfeeding infants. Additionally, the sample sizes for the breastfeeding populations are small and estimates may therefore tend to be less statistically reliable.

Assuming current fortification practices as well as the proposed Minute Maid fortification, the population of fruit juice and juice drink users ages 2 years and older is estimated to consume an average of 306 IU vitamin D per day; the estimated 90th percentile of intake for this population is 519 IU per day. The mean intake of vitamin D by non-breastfeeding infants under the age of 1 year ranges from 425 to 443 IU per day, and 90th percentiles of intake range from 566 to 663 IU per day, with higher intakes reported for younger infants (0 through 6 months). Among the non-breastfeeding and non-pregnant/lactating population ages 1 year and older, teenagers are estimated to have the highest daily intake of vitamin D from all current and proposed sources, with a mean intake of 365 IU per day and a 90th percentile of intake of 657 IU per day. Pregnant and/or lactating females ages 19 and older are estimated to have a mean vitamin D intake of 396

IU per day and a 90th percentile intake of 691 IU per day following the proposed fortification of fruit juices and juice drinks.

B. Intake of vitamin D from selected food sources

ENVIRON estimated mean intake of vitamin D from dairy sources, the proposed fortified fruit juices and juice drinks, and from all dietary sources combined by users of fruit juice and juice drink beverages. As shown in Table 4, dairy products and fortified fruit juices and juice drinks each provide approximately one-third of the total mean vitamin D intake in the population ages 2 years and older, with mean intakes by source of 98, 110, and 306 IU per day, respectively, and 90th percentile intakes of 230, 211, and 519 IU per day.

C. Intake of vitamin D from dietary supplements

According to published results from NHANES III on the use of vitamin and/mineral supplements, approximately 40 percent of the population 2 months of age and older reported taking vitamin, mineral, or other types of dietary supplements at some point during the month prior to the household interview (Ervin et al., 1999). Approximately two-thirds of the population reported taking only one supplement, with many of these supplement users (46 percent) reporting use of a combination vitamin/mineral product.

ENVIRON's analysis of the NHANES III data for reported intakes of vitamin D indicate that among all populations of users, the mode of vitamin D intake was 400 IU per day (Table 3). Infants younger than one year of age and between one and two years frequently consumed supplemental vitamin D in the form of a multivitamin drop (presumably under a doctor's supervision), while older children and adults typically consumed vitamin D-containing multivitamin or calcium tablets.

Data suggest that the use of vitamin and mineral supplements has increased since the time of NHANES III. Results of a 1999 Gallup survey indicate that use of vitamins and minerals among all adults was 33% in 1991, while approximately 45% of adults reported use in 1998 (Gallup July 1999).

Findings from another Gallup survey (Gallup August 1999) indicate that vitamin users report above average use of calcium-fortified foods, and the presence of children and/or dieters in the household also encourages the purchase of calcium fortified foods and beverages. These results suggest that potential users of calcium and vitamin D fortified fruit juices and juice drinks are likely to have supplemental sources of vitamin D.

Given these findings, ENVIRON suggests that within each population group, 400 IU be added to estimated intakes of vitamin D from dietary sources to account for the potential use of a supplement.

Assuming an additional intake of 400 IU from a dietary supplement, the estimated 90th percentile of vitamin D intake within all population groups ranges from approximately 900 to 1100 IU per day assuming current vitamin D fortification practices.

Non-breastfeeding infants under one year of age consistently had the highest estimated vitamin D intakes. The 90th percentile of vitamin D intake among the youngest non-breastfeeding infants (0 through 6 months of age) is 663 IU per day. If these infants also consume a vitamin D-containing supplement, total vitamin D intake is estimated to approach 1100 IU per day, which is in excess of the Tolerable Upper Limit Level (UL) of 1000 IU per day established for this population of infants (IOM 1997). Lower mean and 90th percentile intakes (425 to 566 IU) were reported for older non-breastfeeding infants (7 through 12 months), presumably because these infants are at a stage where they are consuming more solid foods and less fortified infant formula. In this population, the combined total vitamin D intake from current sources, the proposed fortification of fruit juice and juice drinks, and a dietary supplement is approximately 966 IU per day, which is below the UL of 1000 IU per day.

Among populations of non-breastfeeding individuals ages 1 year and older examined in this analysis, the 90th percentile of combined intake of vitamin D from all current, proposed, and supplemental sources is estimated to range from approximately 900 to 1100 IU per day, which is below the UL of 2000 IU per day that was established for these populations.

IV. Conclusions

Estimates of cumulative vitamin D intakes resulting from the proposed fortification of fruit juices and juice drinks were calculated based on knowledge of practices of vitamin D fortification in the U.S. at the time of the analysis.

Among the fruit juice and juice drink consuming populations of Americans ages 1 year and older and non-breastfeeding infants 7 through 12 months of age, the estimated intakes of vitamin D resulting from the proposed fortification falls below the Tolerable Upper Intake Levels of vitamin D as established by the Institute of Medicine.

At the 90th percentile of vitamin D intake, non-breastfeeding infants ages 0 through 6 months who consume the vitamin D fortified beverages and a vitamin D-containing supplement in addition to formula have the potential for exceeding the UL for vitamin D by approximately 60 IU per day.

V. References

[Includes references used in development of the vitamin D database]

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The Minute Maid Company
Intake of Vitamin D (July 2000), Revised 2002

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Table 1. Vitamin D Fortification Permitted by Approved Uses

Category of Food	CFR Citation and Definition of Food Category	Maximum Use of Vitamin D - IU per 100 g food (as served)
Breakfast cereals	21 CFR §170.3(n)(4) *Breakfast cereals, including ready-to-eat and instant and regular hot cereals.*	350
Grain products and pastas	21 CFR §170.3(n)(23) *Grain products and pastas, including macaroni and noodle products, rice dishes, and frozen multicourse meals, without meat or vegetables.*	90
Milk	21 CFR §170.3(n)(30) *Milk, whole and skim, including only whole, lowfat, and skim fluid milks.*	42
Milk products	21 CFR §170.3(n)(31) *Milk products, including flavored milks and milk drinks, dry milks, toppings, snack dips, spreads, weight control milk beverages, and other milk origin products.*	89
Margarine	21 CFR §166.110 *Margarine, defined to contain not less than 80% fat.*	Not less than 1,500 IU of vitamin D per pound (330 IU per 100 g food)
Infant formula	412(g) of the Federal Food, Drug, and Cosmetic Act or the regulations promulgated under section 412(a)(2) of the act	40 to 100 IU per 100 kilocalories
Source: 21 CFR §184.1950		

Table 2. Vitamin D Fortification Permitted by Standards of Identity for Milk, Milk Products, and Grain Products and Pastas

Food category	CFR citation: Standard of Identity	Allowable vitamin D fortification [a]	Allowable vitamin D per 100 g food as labeled [b]
MILK			
Milk	21CFR §131.110	400 IU/quart	41 IU [b]
MILK PRODUCTS			
Acidified milk	21CFR §131.111	400 IU/quart	41 IU [b]
Cultured milk	21CFR §131.112	400 IU/quart	41 IU [b]
Concentrated milk	21CFR §131.115	25 IU/fluid ounce	78 IU [c]
Nonfat dry milk fortified with vitamins A and D [d]	21CFR §131.127	400 IU/quart prepared as per label directions	41 IU [b, e]
Evaporated milk [d]	21CFR §131.130	25 IU/fluid ounce	78 IU g [c]
Dry whole milk	21CFR §131.147	400 IU/quart prepared as per label directions	41 IU [b, e]
Yogurt	21CFR §131.200	400 IU/946 ml (quart)	41 IU g [f]
Lowfat yogurt	21CFR §131.203	400 IU/946 ml (quart)	41 IU g [f]
Nonfat yogurt	21CFR §131.206	400 IU/946 ml (quart)	41 IU g [f]
GRAIN PRODUCTS AND PASTAS			
Enriched cornmeal	21CFR §137.260	Not less than 250 and not more than 1000 USP [g] units/pound	55 - 220 IU [h]
Enriched farina	21CFR §137.305	Not less than 250 USP units/pound finished enriched farina	≥ 55 IU [h]
Enriched rice	21CFR §137.350	Not less than 250 and not more than 1000 USP units/pound	55 - 220 IU [h]
Enriched macaroni products; Enriched vegetable macaroni products	21CFR §139.115 21CFR §139.135	Not less than 250 and not more than 1000 USP units/pound finished food	55 - 220 IU [h]
Enriched noodle products; Enriched vegetable noodle products	21CFR §139.155 21CFR §139.165	Not less than 250 and not more than 1000 USP units/pound finished food	55 - 220 IU [h]

[a] Levels in milk and milk products may be up to 50 percent higher than these values; Good Manufacturing Practice requires fluid dairy products to contain 100-150 percent of the allowed concentration of vitamin D.
[b] Assumes 976-980 g per quart (USDA, 1999)
[c] Assumes 31.9 g per fluid ounce evaporated milk (USDA, 1999).
[d] Vitamin D fortification is mandatory.
[e] As consumed.
[f] Assumes 980 g per quart (USDA, 1999).
[g] Assumes 1 USP is 1 IU.
[h] Assumes 2.2 pounds per kg; vitamin D concentration in dry grain.

Table 3. Summary of Estimated Daily Per Person Vitamin D Consumption from All Current Food Sources and Proposed Uses in the U.S. by Population Group

Population Group	Survey Population n	Users of fruit juices & juice drinks		Vitamin D intake prior to fortification of fruit juices & juice drinks [a]		Vitamin D intake including fortification of fruit juices & juice drinks [a]		Vitamin D intake from a dietary supplement (IU) [b]	Tolerable Upper Intake Level [c] (IU)
		n	% of survey population	Average intake per user per day (IU)	90th percentile intake per user per day (IU)	Average intake per user per day (IU)	90th percentile intake per user per day (IU)		
0 through 6 months (non-breastfeeding)	157	49	33	386	583	443	663	400	1000
0 through 6 months (breastfeeding)	71	16	25	84	165	103	189		
7 through 12 months (non-breastfeeding)	112	75	67	373	516	425	566	400	1000
7 through 12 months (breastfeeding)	19	9	41	159	293	235	391		
1 through 3 years (non-breastfeeding)	1791	1443	81	229	389	336	518	400	2000
1 through 3 years (breastfeeding)	43	32	69	148	268	215	327		
4 through 8 years	1650	1194	73	220	368	322	490	400	2000
9 through 13 years	1112	717	64	229	395	336	536	400	2000
14 through 18 years	882	476	55	220	452	365	657	400	2000
19 through 30 years	1614	695	45	168	331	303	530	400	2000
31 through 50 years	3298	1266	39	186	366	293	508	400	2000
51 through 70 years	3145	1374	45	182	343	274	466	400	2000
71 through 90 years	1297	640	50	199	355	279	468	400	2000
Pregnancy/Lactation ≤ 18 years	6	6	100	274	363	413	521	400	2000
Pregnancy/Lactation 19 through 50 years	106	60	51	247	395	396	691	400	2000
Total population: 2 years and older	**14262**	**7355**	**49**	**197**	**368**	**306**	**519**	**400**	**2000**

Data source: U.S. Department of Agriculture, Agricultural Research Service. Continuing Survey of Food Intakes by Individuals (CSFII) 1994-96 (USDA 1998). Estimates represent 2-day average intakes by users of fruit juices and/or juice drinks. All estimates were calculated with USDA survey weighting factors.

[a] Estimates of means and 90th percentiles that are based on sample sizes fewer than 48 and 128, respectively, are potentially unreliable in a statistical sense due to insufficient sample size as recommended in statistical reporting standards (FASEB/LSRO 1995).

[b] Mode of intake; results from NHANES III, Vitamin and/or Mineral Supplement use (US DHHS 1998).

[c] The Tolerable Upper Intake Level (UL) is defined as the maximum level of daily nutrient intake that is likely to pose no risk of adverse effects to members of the healthy general population. Unless specified otherwise, the UL represents total intake from food (excluding breast milk), water, and supplements (IOM 1997).

Table 4. Contributions of Vitamin D from Dairy Products and Fortified Fruit Juices & Juice Drinks to Total Intake of Vitamin D

Population Group	Users of fruit juices & juice drinks		Mean intake of vitamin D: intake from selected food sources and total intake [a] (intake per user per day (IU))					
			Dairy products [b]		Fruit juices & juice drinks [c]		Total intake [d]	
	n	% of survey population	Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile
0 through 6 months (non-breastfeeding)	49	33	11	--- [e]	57	132	443	663
0 through 6 months (breastfeeding)	16	25	< 1	---	19	30	103	189
7 through 12 months (non-breastfeeding)	75	67	41	158	52	88	425	566
7 through 12 months (breastfeeding)	9	41	84	201	76	156	235	391
1 through 3 years (non-breastfeeding)	1443	81	163	310	107	209	336	518
1 through 3 years (breastfeeding)	32	69	105	192	68	132	215	327
4 through 8 years	1194	73	143	269	102	198	322	490
9 through 13 years	717	64	143	284	107	199	336	536
14 through 18 years	476	55	121	289	145	303	365	657
19 through 30 years	695	45	73	187	135	249	303	530
31 through 50 years	1266	39	78	182	107	208	293	508
51 through 70 years	1374	45	70	171	92	174	274	466
71 through 90 years	640	50	87	200	80	149	279	468
Pregnancy/Lactation ≤ 18 years	6	100	156	277	139	211	413	521
Pregnancy/Lactation 19 through 50 years	60	51	142	242	148	302	396	691
Total population: 2 years and older	**7355**	**49**	**98**	**230**	**110**	**211**	**306**	**519**

Data source: U.S. Department of Agriculture, Agricultural Research Service. Continuing Survey of Food Intakes by Individuals (CSFII) 1994-96 (USDA, 1998). Estimates represent 2-day average intakes by users of fruit juices and/or juice drinks. All estimates were calculated with USDA survey weighting factors.

[a] Estimates of means that are based on sample sizes fewer than 48 are potentially unreliable in a statistical sense due to insufficient sample size as recommended in statistical reporting standards (FASEB/LSRO 1995).

[b] Vitamin D in dairy products includes naturally occurring vitamin D and current fortification of milk and milk products

[c] Vitamin D in fruit juices & juice drinks reflects proposed levels of fortification

[d] Total intake of vitamin D includes naturally occurring vitamin D, current fortification of vitamin D, and proposed fortification in fruit juices & juice drinks

[e] Not estimated.

Appendix A. Proposed Vitamin D Fortification Levels in Fruit Juices and Juice Drinks

FOOD CODE	CATEGORY	FOOD NAME	Vitamin D per 240 mL (1U)	Vitamin D per 100 g (1U)
64116100	FRUIT JUICE	GRAPE JUICE, UNSWEETENED, W/ ADDED VITAMIN C	100	39.87
67202000	FRUIT JUICE	APPLE JUICE, BABY	100	39.87
64132020	FRUIT JUICE	PRUNE JUICE, UNSWEETENED	100	39.87
64132010	FRUIT JUICE	PRUNE JUICE, NS AS TO ADDED SWEETENER	100	39.87
64125000	FRUIT JUICE	PINEAPPLE JUICE-NON-CITRUS JUICE BLEND, UNSWEETENED	100	39.87
64124200	FRUIT JUICE	PINEAPPLE-APPLE-GUAVA JUICE, W/ ADDED VITAMIN C	100	39.87
64124060	FRUIT JUICE	PINEAPPLE JUICE, UNSWEETENED, W/ VIT C	100	39.87
64124030	FRUIT JUICE	PINEAPPLE JUICE, W/ SUGAR	100	39.87
64124010	FRUIT JUICE	PINEAPPLE JUICE, NS AS TO SWEETENED	100	39.87
67203450	FRUIT JUICE	APPLE-CRANBERRY JUICE, BABY	100	39.87
64116050	FRUIT JUICE	GRAPE JUICE, NS AS TO SWEETENED, W/ ADDED VITAMIN C	100	39.87
64116020	FRUIT JUICE	GRAPE JUICE, UNSWEETENED	100	39.87
64116010	FRUIT JUICE	GRAPE JUICE, NS AS TO ADDED SWEETENER	100	39.87
64105500	FRUIT JUICE	CRANBERRY-WHITE GRAPE JUICE MIXTURE, UNSWEETENED	100	39.87
64105400	FRUIT JUICE	CRANBERRY JUICE, UNSWEETENED	100	39.87
64104550	FRUIT JUICE	APPLE-GRAPE-RASPBERRY JUICE	100	39.87
64124020	FRUIT JUICE	PINEAPPLE JUICE, UNSWEETENED	100	39.87
61201230	FRUIT JUICE	GRAPEFRUIT JUICE, CANNED, BOTTLED, CARTON, W/ SUGAR	100	39.87
61201000	FRUIT JUICE	GRAPEFRUIT JUICE, NFS	100	39.87
64122030	FRUIT JUICE	PEACH JUICE, W/ SUGAR	100	39.87
61225230	FRUIT JUICE	PINEAPPLE-ORANGE JUICE, CANNED, W/ SUGAR	100	39.87
61219650	FRUIT JUICE	APRICOT-ORANGE JUICE	100	39.87
61214000	FRUIT JUICE	GRAPE-TANGERINE-LEMON JUICE	100	39.87
61213000	FRUIT JUICE	TANGERINE JUICE, NFS	100	39.87
67203200	FRUIT JUICE	APPLE-BANANA JUICE, BABY	100	39.87
61210230	FRUIT JUICE	ORANGE JUICE, CANNED/BOTTLED/CARTON, W/ SUGAR	100	39.87
67203400	FRUIT JUICE	APPLE-CHERRY JUICE, BABY	100	39.87
67230000	FRUIT JUICE	APPLE-SWEETPOTATO-JUICE,BABY FOOD	100	39.87

67212000	FRUIT JUICE	PEAR JUICE, BABY FOOD	100	39.87
67205000	FRUIT JUICE	ORANGE JUICE, BABY	100	39.87
67204000	FRUIT JUICE	MIXED FRUIT JUICE, NOT CITRUS, BABY	100	39.87
67203900	FRUIT JUICE	MANGO-GRAPE-PEAR JUICE, BABY	100	39.87
67203500	FRUIT JUICE	APPLE-GRAPE JUICE, BABY	100	39.87
64104200	FRUIT JUICE	APPLE-PEAR JUICE	100	39.87
61210630	FRUIT JUICE	ORANGE JUICE, FROZEN, W/ SUGAR, RECONST W/ WATER	100	39.87
61207200	FRUIT JUICE	LIME JUICE, CANNED OR BOTTLED	100	39.87
64104500	FRUIT JUICE	APPLE-GRAPE JUICE	100	39.87
61216000	FRUIT JUICE	GRAPEFRUIT & ORANGE JUICE, NFS	100	39.87
61210820	FRUIT JUICE	ORANGE JUICE,FROZ, W/,CALCIUM ADDED,RECON W/WATER	100	39.87
61210720	FRUIT JUICE	ORANGE JUICE, FROZEN, UNSWEETENED, NOT RECONSTITUTD	350	139.55
61210620	FRUIT JUICE	ORANGE JUICE, FROZEN, UNSWEETENED, RECONST W/ WATER	100	39.87
61210250	FRUIT JUICE	ORANGE JUICE, W/ CALCIUM, CAN/BOTTLE/CARTON, UNSWEET	100	39.87
61216220	FRUIT JUICE	GRAPEFRUIT & ORANGE JUICE, CANNED, UNSWEETENED	100	39.87
61210000	FRUIT JUICE	ORANGE JUICE, NFS	100	39.87
61219000	FRUIT JUICE	ORANGE & BANANA JUICE	100	39.87
61207000	FRUIT JUICE	LIME JUICE, NS AS TO FORM	100	39.87
61204200	FRUIT JUICE	LEMON JUICE, CANNED OR BOTTLED	100	39.87
61204000	FRUIT JUICE	LEMON JUICE, NS AS TO FORM	100	39.87
61201620	FRUIT JUICE	GRAPEFRUIT JUICE, FROZEN, UNSWEETENED (RECONST)	100	39.87
61201240	FRUIT JUICE	GRAPEFRUIT JUICE, CANNED/BOTTLE/CARTON, W/ LOW CAL S	100	39.87
61201220	FRUIT JUICE	GRAPEFRUIT JUICE, CANNED, BOTTLED, CARTON, UNSWEET	100	39.87
61201020	FRUIT JUICE	GRAPEFRUIT JUICE, UNSWEETENED, NS AS TO FORM	100	39.87
61210220	FRUIT JUICE	ORANGE JUICE, CANNED/BOTTLED/CARTON, UNSWEETENED	100	39.87
61226000	FRUIT JUICE	STRAWBERRY-BANANA-ORANGE JUICE	100	39.87
64132030	FRUIT JUICE	PRUNE JUICE, W/ SUGAR	100	39.87
64104150	FRUIT JUICE	APPLE-CHERRY JUICE	100	39.87
64104090	FRUIT JUICE	APPLE JUICE WITH ADDED VITAMIN C AND CALCIUM	100	39.87
64104050	FRUIT JUICE	APPLE JUICE, W/ ADDED VITAMIN C	100	39.87
64104010	FRUIT JUICE	APPLE JUICE	100	39.87
64101010	FRUIT JUICE	APPLE CIDER (INCLUDE CIDER, NFS)	100	39.87
61216010	FRUIT JUICE	GRAPEFRUIT & ORANGE JUICE, FRESH	100	39.87

64100100	FRUIT JUICE	FRUIT JUICE, NFS (INCLUDE MIXED FRUIT JUICES)	100	39.87
64104450	FRUIT JUICE	APPLE-RASPBERRY JUICE	100	39.87
61225600	FRUIT JUICE	PINEAPPLE-ORANGE JUICE, FROZEN, RECONST W/ WATER	100	39.87
61225220	FRUIT JUICE	PINEAPPLE-ORANGE JUICE, CANNED, UNSWEETENED	100	39.87
61225200	FRUIT JUICE	PINEAPPLE-ORANGE JUICE, CANNED, NS AS TO SWEETENER	100	39.87
61225000	FRUIT JUICE	PINEAPPLE-ORANGE JUICE, NFS	100	39.87
61222220	FRUIT JUICE	PINEAPPLE-GRAPEFRUIT JUICE, CANNED, UNSWEETENED	100	39.87
61219150	FRUIT JUICE	ORANGE-WHITE GRAPE-PEACH JUICE	100	39.87
61219100	FRUIT JUICE	PINEAPPLE-ORANGE-BANANA JUIICE	100	39.87
64100110	FRUIT JUICE	FRUIT JUICE BLEND, 100% JUICE, W/ VITAMIN C	100	39.87
67203000	FRUIT JUICE	APPLE W/ OTHER FRUIT JUICE, BABY	100	39.87
64123000	FRUIT JUICE	PEAR-WHITE-GRAPE-PASSION FRUIT JUICE,W/ADDED VIT C	100	39.87
67211000	FRUIT JUICE	ORANGE-APPLE-BANANA JUICE, BABY	100	39.87
67203800	FRUIT JUICE	GRAPE JUICE, BABY	100	39.87
67203700	FRUIT JUICE	APPLE-PRUNE JUICE, BABY	100	39.87
67203600	FRUIT JUICE	APPLE-PEACH JUICE, BABY	100	39.87
92530310	JUICE DRINK	CHERRY DRINK W/ VITAMIN C ADDED	100	39.87
92530110	JUICE DRINK	APPLE DRINK W/ VITAMIN C ADDED	100	39.87
92520910	JUICE DRINK	LEMONADE, LOW CALORIE	100	39.87
92520810	JUICE DRINK	GRAPE DRINK, LOW CALORIE	100	39.87
92520410	JUICE DRINK	FRUIT DRINK, LOW CALORIE	100	39.87
92511510	JUICE DRINK	STRAWBERRY-FLAVORED DRINK	100	39.87
92530410	JUICE DRINK	CITRUS DRINK W/ VITAMIN C ADDED	100	39.87
92511350	JUICE DRINK	ORANGE-RASPBERRY JUICE DRINK	100	39.87
92530710	JUICE DRINK	GRAPE DRINK W/ VITAMIN C ADDED	100	39.87
92511340	JUICE DRINK	PINEAPPLE-ORANGE JUICE DRINK	100	39.87
92511310	JUICE DRINK	PINEAPPLE-GRAPEFRUIT JUICE DRINK	100	39.87
92511290	JUICE DRINK	PAPAYA JUICE DRINK	100	39.87
92511280	JUICE DRINK	ORANGE-GRAPE-BANANA JUICE DRINK	100	39.87
92511270	JUICE DRINK	ORANGE-PEACH JUICE DRINK	100	39.87
92511260	JUICE DRINK	ORANGE-CRANBERRY JUICE DRINK	100	39.87
92511250	JUICE DRINK	CITRUS FRUIT JUICE DRINK (INCL 5-ALIVE)	100	39.87
92511240	JUICE DRINK	ORANGE-LEMON DRINK	100	39.87

92511220	JUICE DRINK	ORANGE DRINK (INCLUDE ORANGE ADE, YABA DABA DEW)	100	39.87
92511400	JUICE DRINK	RASPBERRY-FLAVORED DRINK	100	39.87
92531030	JUICE DRINK	ORANGE BREAKFAST DRINK	100	39.87
92582110	JUICE DRINK	ORANGE BREAKFAST DRINK, CALCIUM FORTIFIED	100	39.87
92582050	JUICE DRINK	FRUIT-FLAVORED DRINK, VITAMIN & MINERAL FORTIFIED	100	39.87
92551700	JUICE DRINK	JUICE DRINK, LOW CALORIE	100	39.87
92551600	JUICE DRINK	CITRUS JUICE DRINK, LOW CALORIE	100	39.87
92550610	JUICE DRINK	FRUIT-FLAVORED DRINK, LOW CAL, W/ VITAMIN C ADDED	100	39.87
92550210	JUICE DRINK	CRANBERRY-APPLE JUICE DRINK, LO CAL, VIT C ADDED	100	39.87
92550110	JUICE DRINK	CRANBERRY JUICE COCKTAIL, LO CAL, W/ VIT C ADDED	100	39.87
92530520	JUICE DRINK	CRANBERRY-APPLE JUICE DRINK W/ VITAMIN C ADDED	100	39.87
92531120	JUICE DRINK	PINEAPPLE-ORANGE JUICE DRINK W/ VITAMIN C ADDED	100	39.87
92530510	JUICE DRINK	CRANBERRY JUICE DRINK W/VIT C ADDED(INCL COCKTAIL)	100	39.87
92531020	JUICE DRINK	ORANGE BREAKFAST DRINK, FROM FROZEN CONCENTRATE	100	39.87
92531010	JUICE DRINK	ORANGE DRINK & ORANGEADE W/ VITAMIN C ADDED	100	39.87
92530910	JUICE DRINK	LEMONADE W/ VITAMIN C ADDED	100	39.87
92530840	JUICE DRINK	GUAVA JUICE DRINK W/ VIT C ADDED	100	39.87
92530810	JUICE DRINK	GRAPEFRUIT JUICE DRINK W/ VITAMIN C ADDED	100	39.87
64116040	JUICE DRINK	GRAPE JUICE, LOW CALORIE SWEETENER	100	39.87
92530610	JUICE DRINK	FRUIT PUNCH/DRINK/ADE W/ VIT C ADDED (INCL HI-C)	100	39.87
92511200	JUICE DRINK	ORANGE-MANGO JUICE DRINK	100	39.87
92531150	JUICE DRINK	PINEAPPLE-ORANGE-GRAPEFRUIT JUICE DRINK W/VITAMIN C	100	39.87
64210010	JUICE DRINK	PAPAYA NECTAR	100	39.87
92510120	JUICE DRINK	APPLE-CHERRY DRINK	100	39.87
92510110	JUICE DRINK	APPLE DRINK	100	39.87
92552100	JUICE DRINK	ORANGE-CRANBERRY JUICE DRINK,LOW CAL,W/ VIT C ADDED	100	39.87
92550300	JUICE DRINK	GRAPEFRUIT JUICE DRINK,LOW CALORIE,W/ VITAMIN C	100	39.87
92550050	JUICE DRINK	APPLE-WHITE GRAPE JUICE DRINK,LOW CAL,W/VIT C ADDED	100	39.87
64215010	JUICE DRINK	PEAR NECTAR	100	39.87
64116030	JUICE DRINK	GRAPE JUICE, W/ SUGAR	100	39.87
92511110	JUICE DRINK	LIMEADE	100	39.87
64120010	JUICE DRINK	PAPAYA JUICE	100	39.87
92510200	JUICE DRINK	APPLE-ORANGE-PINEAPPLE JUICE DRINK	100	39.87

64205010	JUICE DRINK	PEACH NECTAR	100	39.87
64204010	JUICE DRINK	MANGO NECTAR	100	39.87
92610010	JUICE DRINK	HORCHATA, P.R. (BEVERAGE)	100	39.87
64200100	JUICE DRINK	FRUIT NECTAR, NFS	100	39.87
64201010	JUICE DRINK	APRICOT NECTAR	100	39.87
64201500	JUICE DRINK	BANANA NECTAR	100	39.87
64202010	JUICE DRINK	CANTALOUPE NECTAR	100	39.87
64116150	JUICE DRINK	GRAPE JUICE, W/ SUGAR, W/ ADDED VITAMIN C	100	39.87
92510720	JUICE DRINK	FRUIT PUNCH, MADE W/ FRUIT JUICE & SODA	100	39.87
92511020	JUICE DRINK	LEMON-LIMEADE	100	39.87
64203020	JUICE DRINK	GUAVA NECTAR	100	39.87
92511010	JUICE DRINK	LEMONADE	100	39.87
92511000	JUICE DRINK	LEMONADE, FROZEN CONCENTRATE, NOT RECONSTITUTED	350	139.55
64121000	JUICE DRINK	PASSION FRUIT JUICE	100	39.87
92510910	JUICE DRINK	GRAPEFRUIT JUICE DRINK	100	39.87
92510820	JUICE DRINK	GRAPE JUICE DRINK	100	39.87
92510150	JUICE DRINK	APPLE JUICE DRINK	100	39.87
92510730	JUICE DRINK	FRUIT PUNCH, MADE W/ SODA, FRUIT JUICE & SHERBET	100	39.87
92510170	JUICE DRINK	APPLE-CRANBERRY-GRAPE JUICE DRINK	100	39.87
92510650	JUICE DRINK	TAMARIND DRINK, P.R. (REFRESCO DE TAMARINDO)	100	39.87
92510630	JUICE DRINK	FRUIT JUICE DRINK, NFS	100	39.87
64132500	JUICE DRINK	STRAWBERRY JUICE	100	39.87
64133100	JUICE DRINK	WATERMELON JUICE	100	39.87
92510610	JUICE DRINK	FRUIT DRINK (INCLUDE FRUIT PUNCH & FRUIT ADE)	100	39.87
92510310	JUICE DRINK	BANANA-ORANGE DRINK	100	39.87
92510220	JUICE DRINK	APRICOT-PINEAPPLE JUICE DRINK	100	39.87
92511190	JUICE DRINK	ORANGE JUICE DRINK	100	39.87
92510810	JUICE DRINK	GRAPEADE & GRAPE DRINK	100	39.87